

CLAIMS

What is claimed is:

1. A heat treating furnace for providing directional cooling of a workpiece load, comprising:
 - A. a hot zone enclosure defining a hot zone therein, said hot zone enclosure having a side wall, a first end wall, and a second end wall, said side wall having first and second slots formed therethrough and along the length thereof;
 - B. means for injecting a cooling gas into the hot zone through said hot zone enclosure; and
 - C. means for directing the cooling gas to exit the hot zone enclosure through one or both of said slots.
2. The heat treating furnace of Claim 1 wherein the first slot is positioned diametrically opposite the second slot in the side wall of said hot zone enclosure.
3. The heat treating furnace of Claim 1 wherein the cooling gas directing means comprises:
 - a plenum formed around said hot zone enclosure, said plenum having an end wall disposed in parallel relation to the second end wall of said hot zone enclosure, said plenum end wall having first and second openings formed therein such that said first opening is positioned in proximate relation to the first slot and said second opening is positioned in proximate relation to said second slot;
 - a first damper disposed in proximate relation to the first opening for regulating flow of the cooling gas therethrough;
 - a second damper disposed in proximate relation to the second opening for regulating flow of the cooling gas therethrough; and
 - means for selectively moving one or both of said first and second dampers between an open position and a closed position.

4. The heat treating furnace of Claim 1 comprising first and second elongated baffles disposed over the first and second slots, respectively, and means for supporting said first and second baffles in spaced relation from said first and second slots.
5. The heat treating furnace of Claim 1 wherein the cooling gas injecting means comprises a plurality of nozzles extending through the side wall of said hot zone enclosure, said nozzles each comprising a flap valve that permits forced flow of the cooling gas into the hot zone, but impedes unforced flow of a heat treating gas out of the hot zone.
6. The heat treating furnace of Claim 1 wherein the side wall of the hot zone enclosure has a third slot formed through said hot zone enclosure and along the length thereof.
7. The heat treating furnace of Claim 6 comprising first, second, and third elongated baffles disposed over the first, second, and third slots, respectively, and means for supporting said first, second, and third baffles in spaced relation from said first, second, and third slots, respectively.
8. The heat treating furnace of Claim 6 wherein the first, second, and third slots are spaced from one another.
9. The heat treating furnace of Claim 8 wherein the cooling gas directing means comprises:
 - a plenum formed around said hot zone enclosure, said plenum having an end wall disposed in parallel relation to the second end wall of said hot zone enclosure, said plenum end wall having first, second, and third openings formed therein such that said first opening is positioned in proximate relation to the first slot, said second opening is positioned in proximate relation to said second slot, and said third opening is positioned in proximate relation to said third slot;

a first damper disposed in proximate relation to the first opening for regulating flow of the cooling gas therethrough;
a second damper disposed in proximate relation to the second opening for regulating flow of the cooling gas therethrough; and
a third damper disposed in proximate relation to the third opening for regulating flow of the cooling gas therethrough; and
means for selectively moving one or more of said first, second, and third dampers between an open position and a closed position.

10. The heat treating furnace of Claim 6 wherein the side wall of the hot zone enclosure has a fourth slot formed through said hot zone enclosure and along the length thereof.
11. The heat treating furnace of Claim 10 comprising first, second, third, and fourth elongated baffles disposed over the first, second, third and fourth slots, respectively, and means for supporting said first, second, third, and fourth baffles in spaced relation from said first, second, third, and fourth slots, respectively.
12. The heat treating furnace of Claim 10 wherein the first, second, third, and fourth slots are spaced from one another.
13. The heat treating furnace of Claim 10 wherein the cooling gas directing means comprises:
 - a plenum formed around said hot zone enclosure, said plenum having an end wall disposed in parallel relation to the second end wall of said hot zone enclosure, said plenum end wall having first, second, third, and fourth openings formed therein such that said first opening is positioned in proximate relation to the first slot, said second opening is positioned in proximate relation to said second slot, said third opening is positioned in proximate relation to said third slot, and said fourth opening is positioned in proximate relation to said fourth slot;

a first damper disposed in proximate relation to the first opening for regulating flow of the cooling gas therethrough;
a second damper disposed in proximate relation to the second opening for regulating flow of the cooling gas therethrough;
a third damper disposed in proximate relation to the third opening for regulating flow of the cooling gas therethrough;
a fourth damper disposed in proximate relation to the fourth opening for regulating flow of the cooling gas therethrough; and
means for selectively moving one or more of said first, second, third, and fourth dampers between an open position and a closed position.

14. The heat treating furnace of Claim 12 wherein the first and second slots are positioned diametrically opposite one another and the third and fourth slots are positioned diametrically opposite one another.
15. The heat treating furnace of any of Claims 1-14 comprising a blower having an exhaust in fluid communication with the hot zone for providing a cooling gas thereto and an intake in fluid communication with the hot zone for receiving the cooling gas therefrom, whereby the cooling gas can be recirculated through the hot zone.
16. The heat treating furnace of Claim 15 further comprising a heat exchanger disposed between said hot zone enclosure and the blower intake whereby heat can be removed from the cooling gas during operation of the heat treating furnace.
17. A hot zone enclosure for a heat treating furnace comprising a side wall and first and second end walls, wherein, said side wall has first and second slots formed therethrough and along the length thereof.
18. The hot zone enclosure of Claim 17 comprising first and second elongated baffles disposed over the first and second slots, respectively, and means for supporting said first and second baffles in spaced relation from said first and second slots.

19. The hot zone enclosure of Claim 17 or 18 further comprising
a plenum formed around said hot zone enclosure, said plenum
having an end wall disposed in parallel relation to the second end
wall of said hot zone enclosure, said plenum end wall having first
and second openings formed therein such that said first opening
is positioned in proximate relation to the first slot and said second
opening is positioned in proximate relation to said second slot;
a first damper disposed in proximate relation to the first opening
for regulating flow of the cooling gas therethrough; and
a second damper disposed in proximate relation to the second
opening for regulating flow of the cooling gas therethrough.
20. The hot zone enclosure of Claim 17 wherein the side wall of the hot
zone enclosure has a third slot formed through said hot zone enclosure
and along the length thereof.
21. The hot zone enclosure of Claim 20 comprising first, second, and third
elongated baffles disposed over the first, second, and third slots,
respectively, and means for supporting said first, second, and third
baffles in spaced relation from said first, second, and third slots,
respectively.
22. The hot zone enclosure of Claim 20 wherein the first, second, and third
slots are spaced from one another.
23. The hot zone enclosure of Claim 22 comprising:
a first damper disposed in proximate relation to the first opening
for regulating flow of the cooling gas therethrough;
a second damper disposed in proximate relation to the second
opening for regulating flow of the cooling gas therethrough; and
a third damper disposed in proximate relation to the third opening
for regulating flow of the cooling gas therethrough.

24. The hot zone enclosure of Claim 20 wherein the side wall of the hot zone enclosure has a fourth slot formed through said hot zone enclosure and along the length thereof.
25. The hot zone enclosure of Claim 24 comprising first, second, third, and fourth elongated baffles disposed over the first, second, third, and fourth slots, respectively, and means for supporting said first, second, third, and fourth baffles in spaced relation from said first, second, third, and fourth slots, respectively.
26. The heat treating furnace of Claim 24 wherein the first, second, third, and fourth slots are spaced from one another.
27. The hot zone enclosure of Claim 24 comprising:
 - a first damper disposed in proximate relation to the first opening for regulating flow of the cooling gas therethrough;
 - a second damper disposed in proximate relation to the second opening for regulating flow of the cooling gas therethrough;
 - a third damper disposed in proximate relation to the third opening for regulating flow of the cooling gas therethrough; and
 - a fourth damper disposed in proximate relation to the fourth opening for regulating flow of the cooling gas therethrough.
28. The hot zone enclosure of Claim 26 wherein the first and second slots are positioned diametrically opposite one another and the third and fourth slots are positioned diametrically opposite one another.